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TWO NEW SPECIES OF THE FROG GENUS *HYLODES* FROM CAPARAÓ, MINAS GERAIS, BRASIL (AMPHIBIA: LEPTODACTYLIDAE)

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Abstract.—Two new species of the leptodactylid frog genus *Hylodes, H. babax* and *H. vanzolinii,* are described from the Parque Nacional do Caparaó, Minas Gerais, Brasil. The identities of *Elosia* (=*Hylodes*) *glabra* and *H. lateristrigatus* are reviewed.

During a survey of the herpetofauna of the Parque Nacional do Caparaó in November–December 1980, Dr. P. E. Vanzolini and I collected specimens of two species of *Hylodes*. Study of these frogs in the laboratory reveals that both species are new to science.

Examination of other *Hylodes* collected recently in the Atlantic Forests of Brasil, suggests that the current allocation of specific names to certain *Hylodes* species is in error. Reassignment of specific names is clarified preparatory to the description of the two new species from Caparaó.

Advertising calls were recorded on a Uher CR 134 cassette recorder with a Uher microphone or a Sony TCM 280 cassette recorder with a Sennheiser K3U microphone. Calls were analyzed on a Kay Sonagraph 6061 B, narrow filter, AGC in the off position.

Current Status of Names

Relatively few names have been proposed for members of the genus *Hylodes*. As currently understood, the following clusters of species can be recognized on the basis of external morphology. (1) The *H. pulcher* group contains *Hylodes pulcher* (B. Lutz, 1951), a very distinctive, moderate sized, slender, ranoid-like species. The distinctiveness of the species derives from its bright life colors; most individuals have bright blue and/or yellow dorsal spotting. (2) The *H. mertensi* group contains *Hylodes mertensi* (Bokermann, 1956), a large (56 mm SVL), robust species with leathery dorsal skin. (3) The *H. nasus* group contains species that are moderate to large sized, of robust body form, with granular dorsal surfaces, and lacking light dorsolateral stripes. Eight names have been proposed for members of this group: *Elosia aspera* Müller, 1924; *Hyla nasus* Lichtenstein, 1823; *Hyla ranoides* Spix, 1824; *Elosia nasuta* Tschudi, 1838; *Elosia bufonium* Girard, 1853; *Hylodes truncatus* Steindachner, 1864; *Elosia nasus meridionalis* Mertens, 1927; and *Elosia perplicata* Miranda-Ribeiro, 1926. (4) The *H. lateristrigatus* group contains species that are of small to moderate size, body form slender, ranoid-like, dorsum smooth, and in most members with light dorsolateral stripes. The names proposed for this group are *Elosia lateristrigata* Baumann, 1912; *Elosia glabra* Miranda-Ribeiro, 1926; *Elosia magalhaesi* Bokermann, 1964; *Elosia ornata* Bokermann, 1967; *Hylodes regius* Gouvêa, 1979. Both new species belong to this latter cluster.

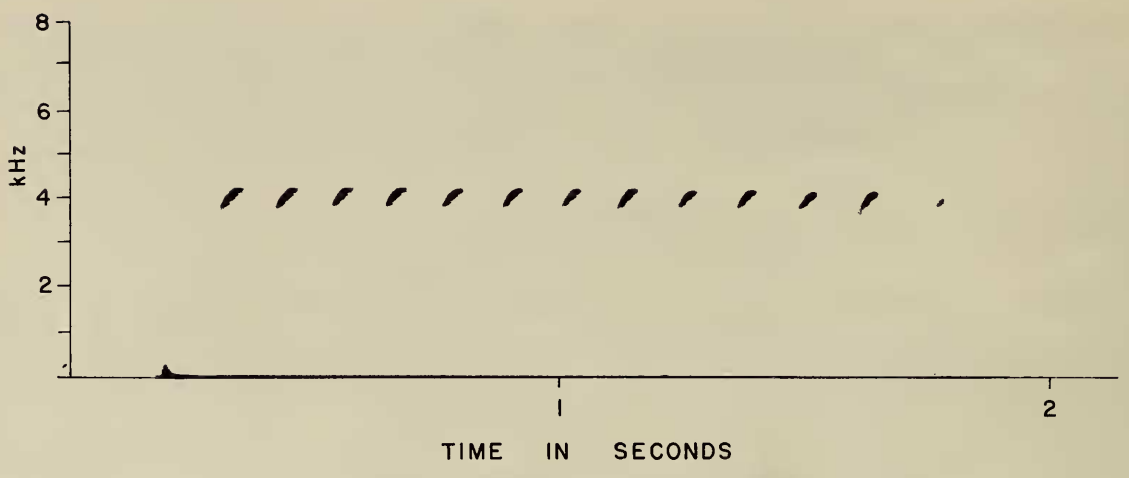

Fig. 1. Advertising call of *Hylodes lateristrigatus*. From specimen USNM 208557, Brasil, Rio de Janeiro, near Teresópolis. Recorded 8 December 1977, air temperature 21.2°C.

The remainder of this section discusses the status of the names in the *H. lateristrigatus* group and summarizes the advertising calls of those species for which calls are known to facilitate comparison with the two new species.

Bokermann (1967b) discussed the taxonomic status of *Elosia* (=*Hylodes*) *lateristrigata* and *glabra*. Prior to Bokermann's 1967 papers, only one species was recognized in the *H. lateristrigatus* group, i.e., the oldest available name, *lateristrigatus*. Bokermann (1967b) discerned two distinctive advertising calls associated with specimens from Friburgo in the Organ Mountains and Paranapiacaba, São Paulo, respectively. He allocated the name *lateristrigatus* to the Organ Mountain species.

Recent collections from around Teresópolis (also in the Organ Mountains) document the presence of two syntopic members of the *H. lateristrigatus* group. The two species are similar morphologically and differ most markedly in size. The larger species (males 38–39 mm SVL) has a call of about 1.5 s duration which consists of about 13 notes; each note is a rising whistle with a dominant frequency of 3700–4300 Hz with about 9 notes per second (Fig. 1). The smaller species (males 33–34 mm SVL) has a call of about 1.1–1.3 s duration which usually consists of only 2–4 notes; each note is a rising and falling whistle with a dominant frequency of 4300–5500 Hz, with 3–4 notes per second (Fig. 2). Bokermann (1967b) assigned the name *E. lateristrigata* Baumann, 1912, to the species with the call shown in Fig. 2 (compare with Fig. 1 in his paper; differences are due to means of analysis, his figures emphasizing harmonic structure).

The type-locality given by Baumann is simply "Orgel-Gebirge." Baumann's (1912) description contains no measurements, although his Figure 1 on Plate 4 is drawn at natural size. I measured the illustration as 38.9 mm SVL, which agrees with data for the larger species at Teresópolis. This form always has sharply defined dorsolateral and lower lip-upper arm stripes, as shown in Baumann's figure. Thus, *H. lateristrigatus* (Baumann) refers to the larger species, with the call shown in Fig. 1, contra Bokermann (1967b).

The species that Bokermann (1967b) recorded from Paranapiacaba and referred to as *glabra* has a call duration of about 2 seconds with 15–30 notes per call, each note a rising whistle with a dominant frequency of 5600–6000 Hz (although his Fig. 2 shows a dominant frequency of about 4700–5500 Hz), and with 10–13 notes

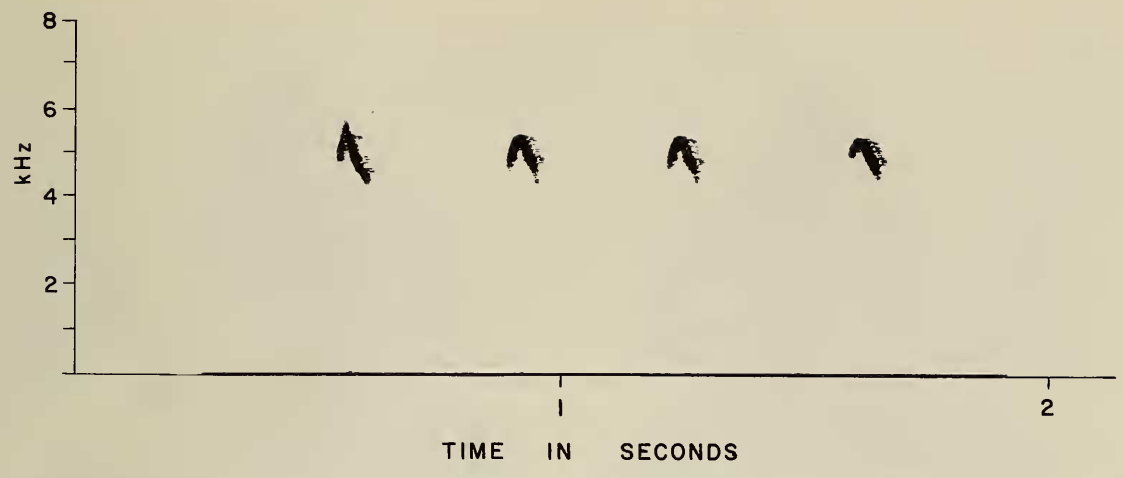

Fig. 2. Advertising call of *Hylodes sp.* From specimen USNM field 6124, Brasil, Rio de Janeiro, near Teresópolis, calling from same stream as USNM 208557. Recorded 8 December 1977, air temperature 21.2°C.

per second. Bokermann examined the type of *Elosia glabra* Miranda-Ribeiro, but was not able to locate the specific site of "ribeirão da Passagem" within the general type locality of Itatiaia. However, Bokermann found a species of the *H. lateristrigatus* group on the lower slopes of Itatiaia at 700 m which compared well with the specimens from Paranapiacaba and the type of *E. glabra*. Two facts suggest that *E. glabra* does not refer to the species that Bokermann recorded from Paranapiacaba and collected from the lower slopes of Itatiaia. The "ribeirão da Passagem" is in the planalto of Itatiaia at 2200 m elevation at approximately 22°25′S, 44°39′W (P. E. Vanzolini, *in litt.*). Second, the figures of *E. glabra* (Miranda-Ribeiro 1926, Pl. 4, Figs. 1, 1a, 1b) do not appear to represent a species of the *H. lateristrigatus* group. The figures in Miranda-Ribeiro's work are accurate representations of the specimens and species they represent, and show *E. glabra* as a completely uniform brown frog. There are two species of frogs in the upper elevations of Itatiaia that have occasional specimens with a uniform pattern: *Hylodes pulcher* and *Eleutherodactylus* (*Basanitia*) *nigriventris*. The disks of the figure of *E. glabra* appear *Basanitia*-like; the snout shape is *Hylodes*-like. The possibility that *E. glabra* refers to an upper elevation frog, rather than a lower elevation *Hylodes* is merely pointed out here and resolution of this problem is deferred until it can be dealt with in a revision of the entire genus.

The conclusions drawn from the above comments are: (1) *Hylodes lateristrigatus* is the Organ Mountain species with a fast call rate with more notes; (2) the species Bokermann referred to as *Elosia lateristrigata* currently has no name; (3) the species name *glabra* may not refer to the species for which Bokermann described and figured the call; and (4) the calls of *H. lateristrigatus* (in the sense used here) and the calls described by Bokermann (1967b) as *glabra* are distinctive and most probably represent two distinct species.

Hylodes magalhaesi is a moderate sized species (male 30 mm SVL), some individuals of which have a distinctive belly pattern of discrete light spots on a dark background. The advertising call averages about 1 s duration, with about 26 notes per call; each note has a dominant frequency centering on about 2000 Hz, and a rate of 20–25 notes per second (Bokermann 1964).

Hylodes ornatus is a small species (males 25 mm SVL) (Bokermann 1967a).

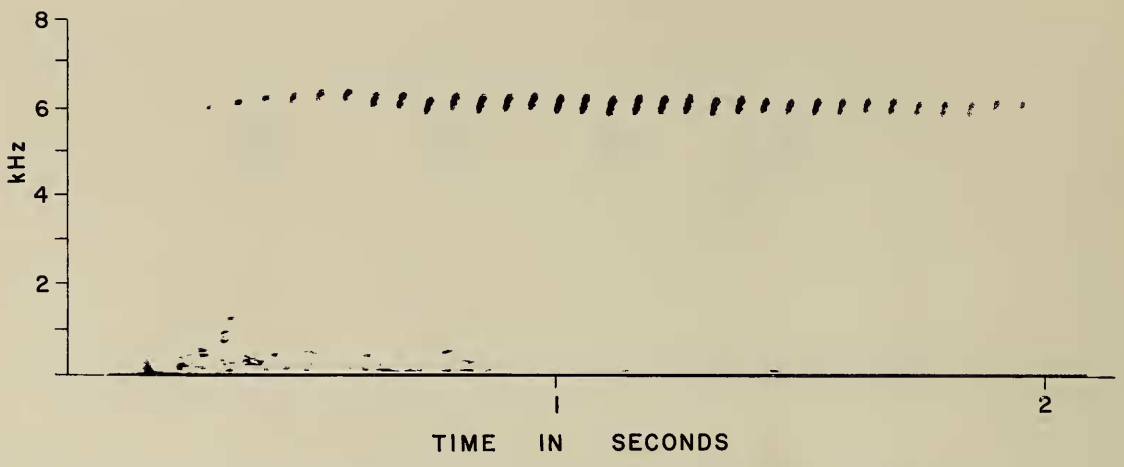

Fig. 3. Advertising call of *Hylodes regius*. From specimen USNM field 5316, Brasil, Rio de Janeiro, Brejo da Lapa, Itatiaia. Recorded 7 January 1977, air temperature 18–20°C.

Most individuals have a distinctive dorsal pattern of two broad light dorsal stripes in addition to the narrow light dorsolateral stripes. Males have external vocal sacs indicating the species is vocal, but the call is presently unrecorded.

Hylodes regius is a moderate sized species (males 33–36 mm SVL) with a distinctive dorsal pattern of small, irregular brilliant yellow spots on the dorsum (Gouvêa 1979). The call is reported here for the first time. The call duration is about 1.7 s, with about 22–32 notes per call. Each note is a sharply rising whistle with a dominant frequency ranging from 5200–6300 Hz, and with 14–19 notes per second (Fig. 3).

The two new species from Caparaó are distinct from all taxa discussed above.

Hylodes babax, new species
Fig. 4

Holotype.—MZUSP 57949, adult male, from Brasil: Minas Gerais; Parque Nacional do Caparaó, 1200 m, 20°26′S, 41°47′W. Collected by W. Ronald Heyer, 30 November 1980.

Paratopotype.—USNM 222553, male, same data as holotype.

Diagnosis.—The dorsal coloration is sharply set off from the lateral coloration by a weakly developed light dorsolateral stripe. This pattern distinguishes *Hylodes babax* from the other new species from Caparaó. *Hylodes babax* is small (male SVL 31–33 mm) and has a dark belly with light spots; the two species at Teresópolis are larger (*lateristrigatus* male SVL 38–40 mm; the second species male SVL 33–34 mm) and have light bellies with dark spots. *Hylodes babax* is larger than *Hylodes ornatus* (males SVL 25 mm) and lacks the distinctive dorsal pattern of a pair of elongate light dorsal bands characteristic of *H. ornatus*. *Hylodes babax* resembles *H. magalhaesi* from Campos do Jordão, Serra da Mantiqueira, São Paulo, Brasil, in size and general coloration. In life, the under surfaces of the legs are brick red in *H. babax*, yellowish in *H. magalhaesi*. The advertising calls of *H. babax* and *magalhaesi* are strikingly different (compare Fig. 4 of Bokermann 1964, with Fig. 5 here) .

Description of holotype.—Snout rounded-truncate from above, protruding in profile; canthus rostralis angular-obtuse; loreal weakly concave in cross section;

Fig. 4. Holotype of *Hylodes babax* (MZUSP 57949, a male): dorsal and ventral views.

tympanum distinct, diameter about ⅔ eye diameter; vomerine teeth in two small transverse patches, medial and just posterior to choanae; vocal slits and well developed lateral vocal pouches present; first finger long, just longer than second; thumb lacking nuptial asperities; dorsal texture essentially smooth, with small pebble like granulations; weak supratympanic fold, no other body folds obvious; no body glands; belly smooth, ventral femur granular; fingers and toes disked, disks about ½ again as broad as toe width just behind disks, toe disks slightly larger than finger disks, each disk with a pair of dorsal scutes; fingers and toes with considerable fringe; subarticular tubercles present but not prominent; ovate inner metatarsal tubercle not quite twice as large as semicircular outer metatarsal tubercle; well developed tarsal fold extending about ⅞ distance of tarsus, continuous distally with outer toe fringe of toe 5; no metatarsal fold; outer tarsus and sole of foot smooth.

SVL 30.6; head length 11.6; head width 9.7; eye–nostril distance 2.5; femur 15.1; tibia 17.2; foot 15.9 mm.

Dorsal pattern of variegated brown and tan markings with irregular dark brown interocular mark; sides almost black, demarcated from dorsal coloration by thin light pinstripe extending from tip of snout over the eye to the upper groin; light lip stripe, broader but less distinctive anteriorly; upper limbs brown with irregular dark transverse bars, upper forearm with light pin stripe on anterior aspect of arm from shoulder to inner elbow; throat black with very few, somewhat symmetrically arranged light dots; belly black with contrasting white irregular spots, posterior surface of thigh with indistinct dark mottle; ventral surface of thigh with pale straw colored patch, other ventral limb surfaces black with little pale areas.

In life the upper lip stripe tannish bronze; the belly with contrasting black and white markings, and the lower surface of the thigh brick (not brilliant) red.

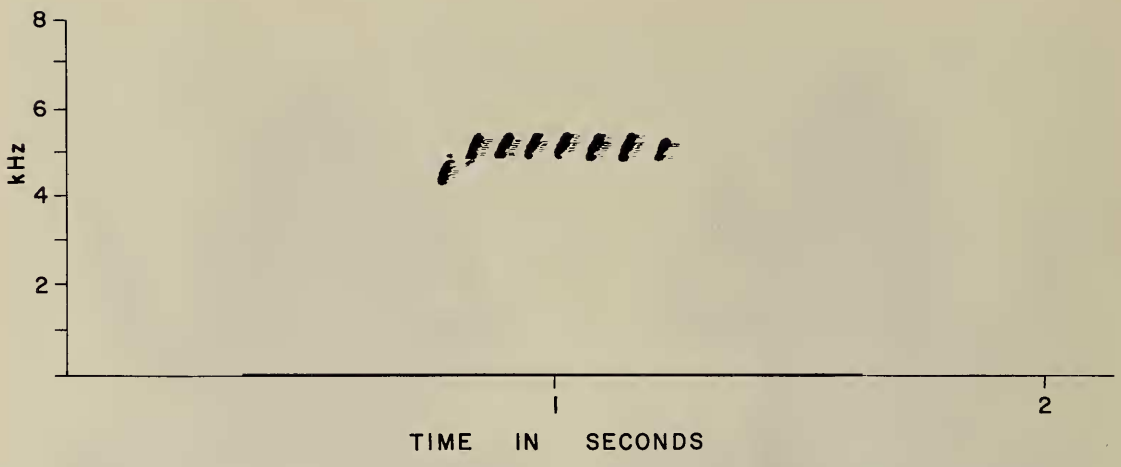

Fig. 5. Advertising call of *Hylodes babax*. From specimen USNM 222553, recorded 30 November 1980, 1540 h, air temperature 21.6°C.

Description of paratopotype.—The paratopotype resembles the holotype in most aspects with the following exceptions: dorsal coloration not as dark, weak bronze colored dorsolateral fold demarcates dorsal and lateral patterns; belly with small and less distinct light spots; SVL 32.6 mm.

Advertising call.—Call duration 0.23–0.48 s, mean 0.36 s; 4–8 notes per call, mode 6; each note a rising whistle, typically first note lower in pitch (mean dominant frequencies 4290–5030 Hz) than remaining notes (mean dominant frequencies 4690–5420 Hz); notes produced at a mean rate of 16.2 notes per second (Fig. 5).

Etymology.—The name *babax* is Greek for chatterer, in allusion both to the insistent diurnal calling of this species (as in many other *Hylodes* species) and to the fact that of the two species of the *H. lateristrigatus* group from Caparaó, this is the only one known to call.

Hylodes vanzolinii, new species
Fig. 6

Holotype.—MZUSP 57950, male, from Brasil: Minas Gerais; Parque Nacional do Caparaó, 2300 m, 20°26′S, 41°47′W. Collected by W. Ronald Heyer and P. E. Vanzolini, 5 December 1980.

Paratopotypes.—MZUSP 52923, collected by Lynn C. Branch, November 1977; USNM 222554-5, same data as holotype.

Diagnosis.—The dorsal color pattern is not sharply set off from the lateral coloration. This pattern is distinct from all other members of the *H. lateristrigatus* group with the possible exception of *glabra* (see comments in previous section), which in the original figure is completely uniform dorsally and ventrally. *Hylodes vanzolinii* has small bright yellow dorsal spots in life (white in preservative) and a variegated belly, differing from the figures of *E. glabra*.

Description of holotype.—Snout rounded-truncate from above, protruding in profile; canthus rostralis angularly obtuse; loreal slightly concave in cross section; tympanum about ½ diameter of eye; vomerine teeth in two small slightly transverse patches between posterior extent of choanae; no vocal slits or vocal sac; first finger long, just longer than second; thumb lacking nuptial asperities; dorsal

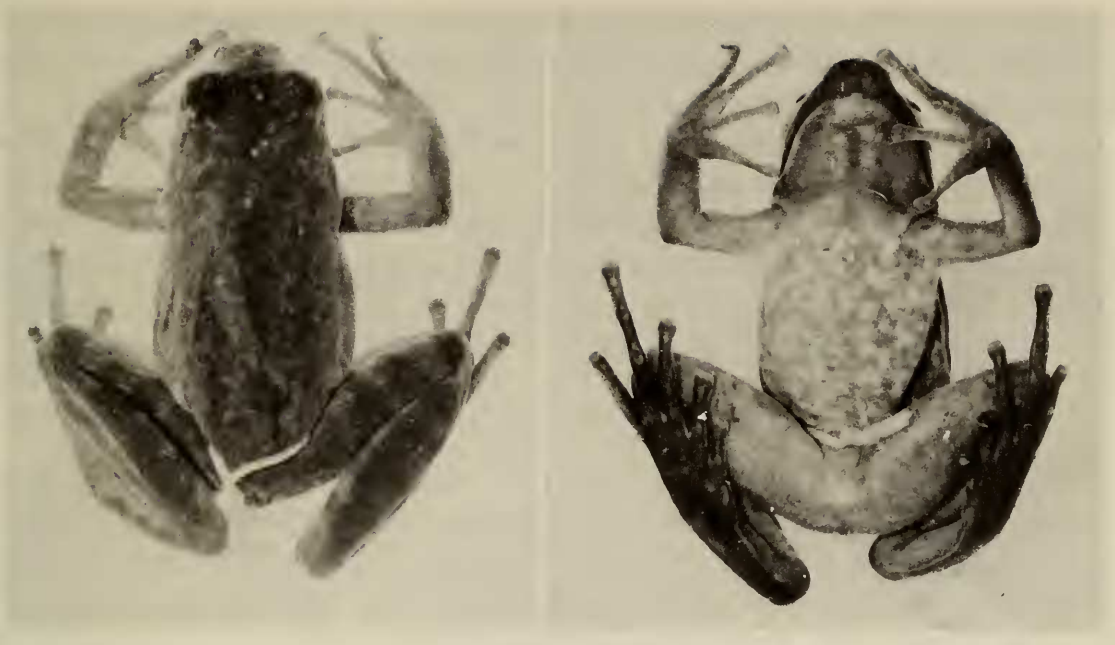

Fig. 6. Holotype of *Hylodes vanzolinii* (MZUSP 57950, a male): dorsal and ventral views.

texture smooth; very weak supratympanic fold, otherwise no other body folds or glandular structures; belly smooth, under surface of thighs granular; finger and toe tips with disks, disks about ½ again as broad as digit immediately behind disk, finger and toe disks about equal size, upper surface of disks with a pair of scutes; fingers with lateral ridge, toes with extensive lateral fringe; subarticular tubercles moderate; inner ovate metatarsal tubercle much larger than rounded outer metatarsal; extensive tarsal fold extending about ⅞ distance of tarsus, continuous distally with toe fringe on outer side of first toe; no metatarsal fold; outer tarsus and sole of foot smooth.

SVL 29.0; head length 10.4; head width 9.5; eye–nostril distance 2.0; femur 16.0; tibia 16.9; foot 15.8 mm.

Dorsum almost black with nondescript grayish mottling and with a few small light dots; dorsal pattern not distinct from lateral pattern except on head with an irregular whitish gray stripe from tip of snout to just over tympanum demarcating dorsal pattern from uniform dark lateral head pattern; light upper lip stripe incomplete, weaker in front of eye than behind; dorsal limb surfaces almost uniformly dark brown, front of forearm with very weak, incomplete light pin-stripe; throat mostly brown with a symmetrical series of medial coalescing spots; belly variegated brown and white in about equal ratio; posterior and ventral surfaces of thighs uniform brown.

In life upper lip stripe dull white; dorsum dark green-black with yellowish flecks; belly white and tan; posterior surface of thigh uniform tan.

Description of paratopotypes.—USNM 222554, a 37.3 mm female, resembles the holotype in pattern with the following differences: the upper lip has a series of light dots, not a stripe; there is no light stripe separating the dorsal color from the side color on the head; the throat is mostly white with some dark markings. MZUSP 52923 is uniformly dark dorsally and laterally except for a few small light dorsal spots and a faint light upper lip stripe mostly in front of the eye; the belly is dark with small, distinct light spots.

Advertising call.—The fact that no *Hylodes vanzolinii* were heard calling, together with the lack of vocal slits in the males, strongly suggests that this species lacks an advertisement call.

Etymology.—It is a pleasure to name this species for P. E. Vanzolini. First, I wish to commemorate an enjoyable field trip during which he shared many insights concerning the Atlantic Forest with me. Second, I wish to pay tribute to Dr. Vanzolini's studies on the montane lizard fauna of eastern Brasil where he developed the concept of stranded species. Without his studies, explanation of the history of this new montane frog would not be possible.

Discussion

Hylodes vanzolinii replaces *H. babax* altitudinally in the Parque Nacional do Caparaó, with the latter occurring along streams in the Atlantic Forest vegetation and *H. vanzolinii* occurring along the exposed streams at elevations above the Atlantic Forest vegetation (1900 m and above). The distributions of the species are so far known only from the collections reported here.

Hylodes babax is similar to several other members of the *H. lateristrigatus* group and on the basis of color pattern is predicted to be related to one of these species than to the altitudinally adjacent *H. vanzolinii.*

Hylodes vanzolinii and *H. regius* (Itatiaia, Serra da Mantiqueira) both have small yellow spots on the dorsum. *Hylodes vanzolinii* differs from *H. regius* in the dorsolateral stripes and in lacking a voice. These two species do not seem to be closely related.

As far as is known, there are only two *Hylodes* species that lack advertising calls, *H. pulcher* and *vanzolinii.* Both of these species are montane (in the coastal mountain system of Brasil at elevations above 1700–1900 meters) species that have striking dorsal colors in life. The relationships between *H. pulcher* and *vanzolinii* are probably not close, however, as the color patterns and sizes are very distinctive.

There are two major zoogeographic patterns that account for montane distributions in eastern Brasil. The first is one of relictual distribution of stranded species associated with drier and cooler climates that today are restricted to the upper elevations of mountains, but that were much more widespread during glacial maxima periods of the Pleistocene (Vanzolini 1982; Vanzolini and Ramos 1977). The montane species that exhibit this zoogeographic pattern are closely related to each other. The second pattern is one of *in situ* differentiation, where the present montane species were independently derived from lowland forms. *Hylodes vanzolinii* appears to fit into this second zoogeographic pattern. Detailed resolution of relationships awaits biochemical and morphological analyses.

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